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Early hominin brain evolution: extracting paleoneurological evidence from the fossil record

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Tracking the early appearance of the derived *Homo*-like neuroanatomical features in the hominin fossil record should contribute the assessment of (i) the inter-taxic evolutionary relationships within the human lineage and (ii) the tempo and mode of the most critical endocranial changes (i.e., size increase, cortical reorganization). Indeed, based on the investigation of East and South African early hominin endocasts, Falk and colleagues (JHE, 2000) have suggested that the paleoneuroanatomical features in *Australopithecus* are consistent with a potential ancestral condition to *Homo* as compared to the more ape-like *Paranthropus* pattern.

Based on recent development of 3D imaging and modelling methods, we revised the endocranial morphoarchitectural pattern of three Pliocene *Australopithecus africanus* (STS 5, STS 60, Taung) and one Early Pleistocene *Paranthropus boisei* (OH 5) representatives with respect to the extant human (n=10), chimpanzee (n=10), and bonobo (n=10) conditions. We combined a semi-automatic technique for extracting the sulcal pattern together with a landmark-free registration method based on deformations. Both local and global information provided by our morphometric approach are used to perform statistical classification and topological analysis of inter- and intra-specific variation.

In association with a morphology of the frontal lobes that substantially differs from the nonhominin condition, the fossil hominin endocasts combine a global neural condition closer to *Pan* than to *Homo*. The *Australopithecus* sulcal pattern preserves both *Homo*- (i.e., the middle and superior frontal sulci organization) and *Pan*-like (i.e., the fronto-orbital sulcus)

features. Additionally, our analyses support a relatively closer affinity between *Australopithecus*/*Homo* than between *Paranthropus*/*Homo.*

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